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United States General Accounting Office

Report to the Chairman, Subcommittee on Readiness, Committee on Armed Services, House of Representatives

COMPLETED

AIR FORCE ADP

Evaluations Needed to Substantiate Modernization Program Benefits

GAO/IMTEC-89-29

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Information Management and
Technology Division

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The Honorable Earl Hutto
Chairman, Subcommittee on Readiness
Committee on Armed Services
House of Representatives

Dear Mr. Chairman:

In a November 9, 1987, letter, your predecessor requested that we review the Air Force Logistics Command's Logistics Management System (LMS) Modernization Program. The program, which began in 1984, consists of nine separate acquisition projects designed to replace and modernize 94 computer systems that help the Command manage spare parts and keep weapon systems in a state of readiness. As of December 1988, the Command estimated that the LMS program would cost nearly $1 billion and be completed in 1994. Total cost, including operation and maintenance over its expected 8-year useful life, will likely exceed $2 billion. The Subcommittee was concerned about the program's cost and schedule and whether expected cost savings and other benefits were being achieved. We briefed your office on the status of the program in March 1988 and provided a report updating that information in December 1988.[1]

This report provides our evaluation of the benefits of the LMS program. As agreed with your office, our objectives were to determine (1) whether the expected cost savings and other benefits the Air Force Logistics Command used to justify the LMS projects have changed since the program was initiated, and (2) what cost savings and other benefits have been achieved to date from operational LMS systems. Appendix I provides detailed information on our objectives, scope, and methodology.

We found that the Command can not substantiate all of the claimed benefits it originally projected for the LMS program. When the program was initiated in 1984, the Command claimed the new systems would provide significant benefits in the form of readiness and logistics support improvements and over $12 billion in cost savings. In 1988, the Air Force Audit Agency evaluated the support for these claimed benefits.

[1] AIR FORCE ADP: Logistics Systems Modernization Costs Continue To Increase (GAO/IMTEC-89-7FS, Dec. 28, 1988).

Our analysis of these evaluations showed that the Command could substantiate most of the mission improvements, but only about $1.9 billion of the estimated cost savings it expected from the new systems. In addition, the Command reduced the scope of two projects but has not estimated the impact of this reduction in terms of lost benefits.

We also found that the Command has not yet begun to evaluate operational systems to determine what cost savings and other benefits have been achieved to date. Regulations require that evaluation plans be prepared early in the development process to ensure that expected benefits are attained. These plans are to be used to conduct interim evaluations once major subsystems become operational and final evaluations once the entire system becomes operational. The Command has spent nearly $600 million on the LMS program and considers two of the new systems fully operational and the other seven systems partially operational. However, evaluation plans have been prepared for only three of the nine LMS projects and no system evaluations have been initiated. In explaining why they had not done the required evaluations, Command officials stated that they have had difficulty in identifying appropriate measurement methods with which to prepare evaluation plans. They further stated that evaluations of the two systems considered to be "fully operational" have been deferred because data is still being loaded in one system and an additional development module has been added to the other.

This report includes recommendations to the Secretary of the Air Force to direct the Air Force Logistics Command to complete preparation of the required evaluation plans, conduct the necessary evaluations of operational systems, and adjust the program cost and benefit estimates, as needed.

LMS Program Background

In November 1984, the Air Force Logistics Command initiated the LMS modernization program to fulfill a long-standing need for modern automated logistics information systems. The new systems are to improve the Command's aircraft maintenance and supply operations by replacing 94 of its more than 385 existing logistics management systems. According to the Command, these 94 systems are the life's blood of its maintenance and supply operations. They perform functions, such as requirements forecasting, material acquisition and control, and maintenance support, that are critical for ensuring the readiness and sustainability of aircraft and other equipment.

The LMS program consists of nine discrete systems modernization projects, each individually justified and approved with its own cost, schedule, and performance parameters. They were designed so that segments or modules, usually replacing an existing system, could be incrementally developed and placed into operation before the full project was complete. In March 1985, the Command estimated that acquisition costs for the LMS program would be about $715 million. It also estimated the total program costs, including operation and maintenance costs over the expected 8-year life of the new systems, to be $1.5 billion. All nine modernization projects were to be completed by 1990.

As of the end of December 1988, the Command estimated that the LMS program acquisition cost had grown to nearly $996 million. On the basis of this higher acquisition cost estimate and our analysis of the Command's original total program cost estimate, we believe that the LMS total program cost will exceed $2 billion. Also, while the Command had spent about $600 million on the LMS projects and considered two of the nine systems fully operational, the scheduled completion date for the total program had slipped 4 years to late 1994. Command officials attributed cost and schedule growth primarily to the lack of clearly defined requirements and/or underestimating project complexity in the early system development stages. Appendix II contains additional background and status information on the nine projects comprising the LMS program.

Originally Projected Program Benefits Not Supported

Defense Directive 7920.1, Life-Cycle Management of Automated Information Systems (AISs), and Instruction 7041.3, Economic Analysis and Program Evaluation for Resource Management, as well as Air Force regulations require that expected program benefits be stated in sufficient detail to clearly define the extent to which existing system deficiencies will be corrected and operations will be improved. A clear statement of these expected benefits is to be a key factor for determining whether a proposed system development is justified and should be approved. Further, this information is to be auditable and relatable to organization missions, functions, and required resources.

In May 1987, we reported[2] that the Command had not stated the expected benefits of the LMS projects in sufficient detail to ensure that the modernized systems would achieve expected benefits. In response to

[2]AIR FORCE COMPUTERS: Development Risks of Logistics Modernization Program Can Be Reduced (GAO/IMTEC-87-19, May 15, 1987).

our report, the Air Force Audit Agency evaluated the documentation supporting the Command's benefit projections. The Agency found that, in general, project files did not contain adequate data or documentation to substantiate the Command's claimed cost savings. In analyzing these evaluations, we found that the Command could adequately support only about $1.9 billion of the about $12.2 billion in cost savings originally expected from the program. The following table shows a comparison of the cost savings originally estimated for each of the nine LMS projects versus those that the Air Force Audit Agency could substantiate.

Table 1: Comparison of LMS Program Benefits

Dollars In Millions

	Projected cost savings	
Project	**Original estimate**	**Substantiated estimate[a]**
Requirements Data Bank	$6,288.2	$82.4
Depot Maintenance Management Information System	741.1	994.7
Contracting Data Management System	1,968.2	67.4
Stock Control and Distribution	3,174.4	193.6
Local Area Network[b]	•	•
Enhanced Transportation Automated Data System	5.0	2.2
Weapon System Management Information System[c]	0.0	398.9
Intersite Gateway[b]	•	•
Engineering Data Computer Assisted Retrieval System	29.2	209.2
Total LMS Program	**$12,206.1**	**$1,948.4**

[a]Benefit estimates as assessed by the Air Force Audit Agency and adjusted by GAO using Air Force Regulation 173-15, Economic Analysis and Program Evaluation for Resource Management, for inflation over an 8-year useful life.

[b]No cost savings were expected from the project. However, the system is needed for communications.

[c]These savings are attributed to the Requirements Execution Availability Logistics Module, which was not part of the original project. This module was originally part of the Requirements Data Bank project.

The Command derived about $8.7 billion of the nearly $12.2 billion in estimated savings, from the increased number of mission capable aircraft expected to be made available through use of the new Requirements Data Bank and the Stock Control and Distribution systems. The Command valued this benefit at the total procurement cost of new aircraft. The Audit Agency did not question the Command's available aircraft estimates, but did not accept the Command's valuation of these benefits.

In addition, the Command reduced the scope of the original program by removing 20 of the existing systems it originally intended to replace.

The Command reduced the scope of the program to hold down its acquisition costs, however, it did not determine the impact on system functionality or expected program benefits. Because of this reduced scope, we believe that the LMS program will provide fewer improvements than were originally anticipated. Appendix III contains additional information concerning projected LMS benefits.

Benefits of Operational LMS Systems Not Evaluated

Defense Instruction 7041.3, Economic Analysis and Program Evaluation for Resource Management, and Air Force Regulation 700-4, Information Systems Acquisition and Major Automated Information Systems Review Requirements direct that the capabilities of operational systems be evaluated to ensure that expected cost savings and improvements are attained and to determine how best to improve ongoing projects. Command regulations further direct that when a new system is implemented incrementally, its operational capabilities and system benefits should also be evaluated incrementally. To prepare for system evaluations, Command regulations require that evaluation plans be developed no later than 120 days after an automated systems development project is initiated. These plans are to be established early in the development process to ensure that appropriate data gathering or benefit tracking mechanisms are implemented to measure and document program effectiveness before and after a new system becomes operational. Using these plans, interim and final evaluations are to be conducted within a year after the system increment or total system becomes operational.

The LMS program, designed for incremental development and implementation, was initiated in November 1984. As such, an evaluation plan incorporating incremental measurement should have been prepared for each LMS project. In September 1986, the Commander of the Logistics Management Systems Center directed that an evaluation plan be prepared for all ongoing LMS projects. However, as of December 1988, the Command had prepared final evaluation plans for only three of the nine modernization projects. Neither interim nor final operational evaluation plans were prepared for the remaining six modernization projects.

Officials responsible for these projects gave various reasons why evaluation plans had not been prepared. Several officials stated that they planned to measure how well their system resolved operational problems, but had not yet identified an appropriate measurement method. Others stated that, rather than develop a specific method to measure benefit achievement, they planned to send questionnaires to system users to obtain opinions on project success. These responses indicate

that the Command has not established the criteria or the techniques needed to evaluate the utility and worth of these projects as required by regulations.

The Command designated two LMS systems as fully operational more than a year ago and, thus, the projects are presumably complete. The remaining seven projects, according to the Command, are from 2 percent to 95 percent complete. Of these projects, six have increments that have been operational for more than 1 year. Consequently, as of December 1988, the Command should have begun final evaluation of the two fully operational systems and conducted several interim system evaluations. However, the Command had not yet begun any evaluations of operational LMS systems or system increments.

Although the Command designated both completed systems as "having full operational capabilities," the project directors explained that the final evaluations had not yet begun because one system did not have the data to operate and the other was still in development. The Command designated the Engineering Data Computer Assisted Retrieval System as having full operational capability in October 1987 and, thus, should have started its final system evaluation in late 1988. However, according to the project director the evaluation has been postponed because of delays in loading the five million active engineering data records required in order for the system to achieve full benefits. The director estimated that it could cost over $10 million and take from 1 to 6 years for the Command to input this data. Similarly, the Weapon System Management Information System was completed in September 1987 and the system's operational evaluation should have started in late 1988. However, its evaluation also has been delayed. The project director stated that an additional module not called for in the original system design was incorporated into the development project. As a result, the Command directed that the evaluation be delayed to include this new module because it is to provide the $398.9 million cost savings currently expected from the system. This new system module is not scheduled to be completed until 1991.

In explaining why interim evaluations of ongoing projects have not been made, Command officials stated that (1) it is difficult to relate specific benefits to the new system increments that are operational, and (2) interim evaluations are expensive. We believe the Command's lack of support for its projected benefits have hampered its ability to relate expected benefits to specific system increments. At the outset of each project, the Command did not, as required, (1) clearly define the extent

to which existing system deficiencies would be improved, and (2) provide documentation, including the methodology and computations, to be used to derive estimates of project benefits. Additionally, the cost of interim evaluations cannot be determined until the Command prepares the plans outlining the data to be gathered and procedures to be followed for making these evaluations.

Because the Command had not conducted any system evaluations, we attempted to informally determine if users of the new LMS systems and system increments were receiving benefits. We interviewed 160 users at five air logistics centers to obtain their views on the benefits being received from operational LMS systems or system increments. They stated that the new systems were meeting their needs significantly better than the systems they replaced. Many users told us that the LMS systems have greatly reduced their work load, as well as the time needed for them to accomplish their mission. Our observations showed that users are receiving benefits from the new LMS systems. Since benefits have been achieved, we believe the Command has the opportunity to measure these benefits in terms of cost savings and mission improvements. Appendix IV contains additional information on the lack of evaluations to determine the benefits of operational LMS systems.

Conclusion

In initiating the LMS modernization program in 1984, the Air Force Logistics Command designed a strategy to acquire nine discrete, automated logistics systems in a manner that would provide user benefits well before each project was completed. Since that time, the Command has spent nearly $600 million and plans to spend nearly $400 million more to complete development of the new automated logistics systems. We support the Command's need for modern automated logistics systems, but believe it is time to begin to systematically evaluate what has been achieved with these expenditures.

As a critical first step to accomplish these evaluations, the Command needs to prepare the long overdue evaluation plans for six of the new systems. We recognize that it is often difficult to identify specific evaluation criteria and methods, but Defense guidance and Air Force regulations require evaluation of program effectiveness. We also believe that the fact that users are satisfied and believe the new systems have provided improvements in their operations is significant. However, this does not preclude the need for system evaluations. Defense and Air Force regulations require final and interim system evaluations to clearly demonstrate (1) what savings and other benefits are actually being

achieved with the new systems, and (2) how these benefits compare with those promised at the outset of the program. While it may be difficult to relate specific benefits to the new system increments and evaluations may be expensive, the Command's regulations require that when a system is implemented incrementally, as are all nine LMS systems, its operational capabilities and resulting benefits be evaluated incrementally.

Recommendations

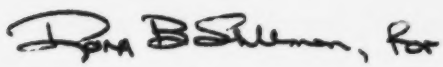
We recommend that the Secretary of the Air Force direct the Commander, Air Force Logistics Command, to comply with Defense guidance and Air Force regulations and:

- Prepare system evaluation plans for all LMS modernization system projects. Where applicable, these plans should provide for interim assessments as portions of new systems become operational as well as final assessments once the entire system is complete. The Command should provide the Secretary a timetable for completing the evaluation plan for each project.
- Using the evaluation plans, expeditiously evaluate the two completed LMS systems and the operational portions of the other seven LMS systems. If evaluations of the two systems designated as having "full operational capabilities" cannot begin immediately, the Command should provide the Secretary an explanation of why the two systems were reported as fully operational when one does not have the data to operate and the other is still in development. Until the final evaluations of these two systems have been completed, the Command should continue to report their costs and status in all program reviews.
- Provide the Secretary a timetable for each project showing when interim and final system evaluations will be completed.
- Adjust project cost and benefit estimates in light of the system evaluations and, if warranted, reassess the cost effectiveness of ongoing LMS projects.

In accordance with the requester's wishes, we did not obtain official agency comments on a draft of this report. We did, however, discuss its contents with Air Force Logistics Command officials and have included their comments where appropriate. We performed our work between August 1987 and February 1989 in accordance with generally accepted government auditing standards.

As agreed with your office, unless you publicly announce its contents earlier, we plan no further distribution of the report until 30 days from its issue date. At that time, we will provide copies of this report to the Secretary of Defense and the Secretary of the Air Force. We will also make copies available to other interested parties upon request. This report was prepared under the direction of William Franklin, Associate Director. Other major contributors are listed in Appendix V.

Sincerely yours,



Ralph V. Carlone
Assistant Comptroller General

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Abbreviations

ADP	automated data processing
AFLC	Air Force Logistics Command
GAO	General Accounting Office
IMTEC	Information Management and Technology Division
LMS	Logistics Management System

Objectives, Scope, and Methodology

Concerns about the current cost and schedule status of the Logistics Management System program and whether operational systems are providing the expected cost savings and operational benefits prompted the Chairman, Subcommittee on Readiness, House Committee on Armed Services, to ask us in a November 1987 letter to review the Logistics Management Systems Modernization program. Following discussions with the committee officials, we agreed to determine (1) the current cost and schedule status of the LMS program, (2) whether the expected cost savings and mission improvements that the Air Force used to justify the program have changed since the program was initiated in 1984, and (3) what cost savings and mission improvements are being received from the operational LMS systems and how these benefits compare to those the Air Force originally expected. In December 1988,[1] we reported on the status of the LMS program. This report provides our evaluation of the expected benefits of the LMS program and those being received from new LMS systems.

To determine the costs, schedules, and benefits that the Logistics Command expected and on which the LMS program was justified and approved, we examined initial planning documents and development plans for each of the original nine modernization projects. Because the Command had not updated its original total program cost estimates, we analyzed the Command's original estimate and made adjustments to correct errors and to incorporate changes in the Command's program acquisition cost estimate. We also received briefings from and held discussions with Command officials responsible for the projects' management and systems' development. In addition, Department of Defense directives and instructions and Air Force regulations governing the initiation, approval, and management of major automated information systems developments were used in our examination of planning documents, such as economic analyses and evaluation plans.

To determine whether the LMS systems' expected cost savings and mission improvements have changed since program approval, we analyzed project planning and status reports and recent Air Force Audit Agency assessments of the Command's documentation supporting its original project benefit estimates. We discussed these assessments with audit agency officials. For comparison purposes, we adjusted the computed cost savings for each project to cover a standard 8-year useful operational life and used Air Force Regulation 173-15, Economic Analysis and

[1] AIR FORCE ADP: Logistics Systems Modernization Costs Continue To Increase (GAO/IMTEC-89-7FS, Dec. 28, 1988).

Program Evaluation for Resource Management, to express these savings in dollar amounts to show their potential offset against future budget requirements in the year they were most likely to occur. We compared these adjusted cost savings to those the Command originally projected as presented in the projects' economic analyses. We did not independently validate the Logistics Command's economic analyses.

To determine what benefits users were receiving from operational LMS systems and how these compared to expected benefits, we reviewed the Command's system completion estimates and received management briefings and a system demonstration concerning current LMS system operational capabilities. We interviewed 160 individual users of operational segments of the Requirements Data Bank, Stock Control and Distribution, Weapon System Management Information System, and the Depot Maintenance Management Information System projects to obtain their views of the benefits being received from operational systems. At each center, we obtained a list of authorized users and selected an organizational cross section of those currently using at least one operational LMS system increment. Because our user selection was not statistically random, the survey results cannot be projected as representative views of all LMS systems' users.

Our review was conducted from August 1987 through February 1989, primarily at the Air Force Logistics Command's Logistics Management Systems Center and the Logistics Management Systems Modernization Program project offices at or near Wright-Patterson Air Force Base, Dayton, Ohio. We also visited the Air Force Audit Agency at Wright-Patterson Air Force Base and the Air Logistics Centers at Ogden, Utah; Oklahoma City, Oklahoma; Sacramento, California; San Antonio, Texas; and Warner Robins, Georgia. In accordance with the requestor's wishes, we did not obtain official agency comments on a draft of this report. However, we discussed the facts in this report with Air Force officials and have included their comments where appropriate. We performed our work in accordance with generally accepted government auditing standards.

Logistics Management System Program Background

The Air Force Logistics Command provides the support (mainly spare parts and depot-level maintenance) to keep Air Force units and weapon systems in a state of readiness and to support these units and weapon systems during war. The Logistics Command determines requirements; acquires items and services; stores and distributes stock; and maintains, modifies, and repairs weapon and support systems. The Command is located at Wright-Patterson Air Force Base, Ohio, and operates five Air Logistics Centers. It employs over 98,000 personnel and manages over 951,000 separate items. The Command administers $135 billion in capital assets and manages over $50 billion annually in operation and maintenance, central procurement, military construction, stock, and industrial funds.

The Command has long relied upon computer technology to provide the enormous amounts of information needed to accomplish its mission. Over 385 automated logistics management systems, many of which were designed in the 1950s and 1960s, are used to collect and process data for decision-making, record-keeping, and reporting to conduct logistics operations. While many of these systems have been improved since their implementation, they have not kept pace with the Command's increasing information requirements. Consequently, the Command initiated several modernization projects designed to improve its logistics management systems.

In November 1984, the Department of Defense decided to merge these modernization projects into the LMS program. The LMS program consists of nine major, discrete acquisition projects designed to modernize current logistics operations by replacing about 94 of the more critical existing computer systems controlling requirements forecasting, materiel acquisition and control, and direct maintenance and support of aircraft and other equipment; automating manual operations; and changing from batch[1] to on-line,[2] real-time[3] processing procedures. Table II.1 lists these projects and their primary objectives.

[1]Batch processing refers to data accumulated over a period of time and then submitted to the computer for processing. The user generally can not interact with the computer while the data is being processed.

[2]On-line refers to a users' ability to access and interact with a computer via a terminal.

[3]Real-time refers to a system's capability to obtain data from an activity or process, perform computations, and return a response rapidly enough to affect the outcome of that activity or process.

Table II.1: LMS Projects and Their Primary Objectives

Project	Primary Objectives
Requirements Data Bank	Compute quantities required and prepare budgets for materiel to support weapon systems and other equipment.
Depot Maintenance Management Information System	Integrate management of depot repair functions.
Contracting Data Management System	Bring together information for buyers and contracting officers to manage contract actions.
Stock Control and Distribution	Control the storage, allocation, and movement of inventories.
Local Area Network	Provide terminal-to-computer and computer-to-computer communications within and among sites.
Enhanced Transportation Automated Data System	Provide airlift, sealift, and truck service information, and in-transit control of selected items.
Weapon System Management Information System	Assess war capabilities, levels of combat operations, and solutions for readiness and sustainability problems.
Intersite Gateway	Provide communications link with Air Force, Defense, and contractor sites through the Defense Data Network from local area networks.
Engineering Data Computer Assisted Retrieval System	Automate indexing, filing, retrieval, and distribution of technical engineering drawings.

Originally, the Command estimated that the program would cost about $715 million to acquire and be completed by 1990. It also estimated that total costs, including operations and maintenance over the expected life (usually 8 years) of the new systems, would be about $1.5 billion. From program initiation in November 1984 through the end of fiscal year 1988, the Command spent nearly $600 million to develop the nine modernization projects. During this same time, cost estimates to complete the modernization grew and its expected completion date significantly slipped.

LMS Program Cost Growth

In March 1985, the Command estimated that the LMS modernization would require about $715 million for development and acquisition of the new systems. As of December 1988, this cost estimate had grown about 39 percent to about $996 million. Table II.2 shows the overall growth in the project acquisition cost estimates.

Table II.2: Acquisition Cost Growth of the Original LMS Modernization Between March 1985 and December 1988

Dollars in millions

Project	Acquisition Cost		
	March 1985	December 1988	Change in cost
Requirements Data Bank	$136.5	$248.8[a]	$112.3
Depot Maintenance Management Information System	82.9	242.2	159.3
Contracting Data Management System	35.3	73.8	38.5
Stock Control and Distribution System	202.2	204.3	2.1
Local Area Network	151.0	125.8	(25.2)
Enhanced Transportation Automated Data System	5.5	11.7	6.2
Weapon System Management Information System[b]	47.4	44.2	(3.2)
Intersite Gateway	21.9	15.3	(6.6)
Engineering Data Computer Assisted Retrieval System[c]	32.7	29.8	(2.9)
Total	**$715.4**	**$995.9**	**$280.5**

[a]Includes $26.6 million for maintenance and enhancement costs of operational increments.

[b]The project was designated as fully operational in September 1987.

[c]The project was designated as fully operational in October 1987.

Cost growth in four projects—the Requirements Data Bank, Depot Maintenance Management Information System, Contracting Data Management System, and the Enhanced Transportation Automated Data System, account for most of the program's overall net cost growth. According to project officials, some of the reasons for cost growth in these projects were

- poorly defined system requirements in early development phases,
- overly optimistic initial cost and schedule estimates,
- conversion from a cost-plus-award-fee contract to a fixed-price-incentive-fee contract,
- identification of additional requirements through the use of information engineering analysis techniques, and
- identification of additional hardware requirements.

We believe that initial estimates were poor, in large part, because as stated in our May 1987 report,[4] the Command began development of the LMS projects without completing required initial planning activities. As a

[4]AIR FORCE COMPUTERS: Development Risks of Logistics Modernization Program Can Be Reduced (GAO/IMTEC-87-19, May 15, 1987).

result, the Command did not fully analyze existing problems in its operations, identify alternatives for correcting these deficiencies, or clearly define the benefits and costs of each alternative.

The $12 million estimated acquisition cost for the Enhanced Transportation Automated Data System is expected to further increase because, according to project officials, the contractor defaulted and the Command terminated the development contract. Also, the slight increase in the acquisition costs for the Stock Control and Distribution project is affected by a scope reduction in the project. The March 1985 estimate of $202.2 million was for a new system replacing 23 existing logistics systems. However, the December 1988 cost estimate of $204.3 million is for a system that replaces only 13 systems.

As of December 1988, the Command had not updated its estimate of total program costs, including the systems' operation and maintenance over their useful life. According to the Chief of the Financial Management Division of the Logistics Management Systems Center, the Command is in the process of updating its original total cost estimates in accordance with guidance provided by Office of the Secretary of Defense's Program Analysis and Evaluation office. Once completed, the Command's estimates are to be reviewed by Headquarters, Air Force, and validated by Defense. The Command expects to publish the new total cost estimates in June 1989. On the basis of our analysis of the Command's original total cost estimates and the incorporation of changes to acquisition cost estimates made since the program began, we estimate that the total LMS program costs will likely exceed $2 billion.

Program Completion Delayed

The projected completion date for the overall LMS modernization program has slipped 4 years. In March 1985, the Command estimated that the completion of the Contracting Data Management System in September 1990 would mark the full operation of the LMS program. However, as of June 1988 the Command expected full program operation to be achieved in September 1994 with the completion of the Requirements Data Bank project. Table II.3 shows the changes in the LMS project completion schedules between March 1985 and June 1988.

Table II.3: LMS Project Completion Schedules

Project	Estimated Completion Dates as of March 1985	Estimated Completion Dates as of June 1988	Change (Months)
Requirements Data Bank	Apr 1989	Sep 1994	65
Depot Maintenance Management Information System	Feb 1989	Sep 1993	55
Contracting Data Management System	Sep 1990	Mar 1994	42
Stock Control and Distribution	Jan 1989	Sep 1990	20
Local Area Network	Jul 1990	Jul 1990	0
Enhanced Transportation Automated Data System[a]	Dec 1986	Jul 1988	19
Weapon System Management Information System[b]	Sep 1987	Sep 1987	0
Intersite Gateway	Dec 1987	Jun 1989	18
Engineering Data Computer Assisted Retrieval System[c]	Feb 1987	Oct 1987	8

[a]The Air Force has terminated the development contract of this project. The schedule is expected to be revised.

[b]The Air Force designated this system as having full operational capability in September 1987.

[c]The Air Force designated this system as having full operational capability in October 1987.

The Requirements Data Bank, Depot Maintenance Management Information System, Contracting Data Management System, and the Stock Control and Distribution projects experienced the greatest schedule slippages. Project management officials attributed these schedule delays to system requirements that were more complex than originally estimated. According to these officials, system requirements were poorly defined in early system development and additional requirements were identified as system development progressed.

Originally Projected Program Benefits Not Supported

The Command cannot substantiate most of the projected cost savings and has reduced expected mission improvements it used when justifying and approving the LMS program. It can substantiate only $1.9 billion of the over $12.2 billion projected cost savings of the LMS modernization. Additionally, the Command has reduced the scope of two LMS systems by removing from each project 10 of the existing systems to be replaced without identifying the impact the reduction may have on expected benefits. Because it cannot substantiate the benefits it originally anticipated and has reduced the scope of the LMS program without assessing the potential impact on system benefits that such a reduction could have, the Command cannot ensure that the new modernization systems are likely to provide the benefits it projected upon program initiation.

Before acquiring new computer systems, Defense Directive 7920.1, Life Cycle Management of Automated Information Systems (AISs), and Defense Instruction 7041.3, Economic Analysis and Program Evaluation for Resource Management, as well as Air Force regulations on systems acquisition, prescribe economic analysis to support the commitment of resources to proposed new projects. In this analysis, expected cost savings and other program benefits from new systems are to be stated in sufficient detail to clearly define the extent to which existing system deficiencies will be corrected and Command operations will be improved. Documentation supporting the analysis is to be auditable and should include the computations used to derive total project benefits, and a detailed description of the method used for developing estimates. A clear statement of expected benefits is a key factor for determining whether a proposed system development is justified and should be approved.

Projected Cost Savings Not Supported

In initiating the original nine LMS modernization projects, the Command prepared economic analyses that projected total program benefits of about $12.2 billion in cost savings and numerous non-monetary mission improvements over the useful economic life of the operational LMS systems. Air Force Audit Agency evaluations of the project documentation supporting these expected benefits showed that the Command could not substantiate most of its claimed cost savings.

In May 1987, we reported[1] that in the LMS project economic analyses, the Command did not always quantify expected benefits as required and did

[1] AIR FORCE COMPUTERS: Development Risks of Logistics Modernization Program Can Be Reduced (GAO/IMTEC-87-19, May 15, 1987).

not establish evaluation criteria to measure a project's success in achieving those benefits. Consequently, the Command had not established a basis or method to compare actual costs and benefits with those expected. Therefore, the Command had no basis on which to determine the value of the LMS program, and could not ensure that the projects would result in the most effective systems at the least cost.

In response to our May 1987 report, the Air Force Audit Agency evaluated supporting documentation for each of the modernization projects to determine whether (1) the Command could substantiate the specific benefits they had projected, and (2) the systems would provide any additional benefits that the Command did not identify. The Audit Agency found that the Command could substantiate most of its claimed mission improvements, but could not substantiate most of its projected cost savings. In analyzing the Agency's evaluations, we found that the Command could substantiate only about $1.9 billion of the nearly $12.2 billion cost savings that they claimed when approving the program. Table III.1 compares the potential LMS cost savings benefits as projected by the Command to those the Audit Agency found to be substantiated by program documentation.

Table III.1: Comparison of LMS Program Benefits

Dollars in millions

Project	Project cost savings		
	Original estimates	Substantiated estimates[a]	Unsupported estimates
Requirements Data Bank	$6,288.2	$82.4	$(6,205.8)
Depot Maintenance Management Information System	741.1	994.7	253.6
Contracting Data Management System	1,968.2	67.4	(1,900.8)
Stock Control and Distribution	3,174.4	193.6	(2,980.8)
Local Area Network[b]	•	•	•
Enhanced Transportation Automated Data System	5.0	2.2	(2.8)
Weapon System Management Information System[c]	0.0	398.9	398.9
Intersite Gateway[b]	•	•	•
Engineering Data Computer Assisted Retrieval System	29.2	209.2	180.0
Project Totals	**$12,206.1**	**$1,948.4**	**$(10,257.7)**

[a]Benefit estimates as assessed by the Air Force Audit Agency and adjusted by GAO using Air Force Regulation 173-15, Economic Analysis and Program Evaluation for Resource Management, for inflation over an 8-year useful life.

[b]No cost savings were expected from the project. However, the system is needed for communications.

[c]These savings are attributed to the Requirements Execution Availability Logistics Module, which was not part of the original project. This module was originally part of the Requirements Data Bank project.

There are significant differences between the benefits projected in the Command's economic analyses and those it can substantiate. The Air Force Audit Agency stated that the projects' documentation generally did not adequately support the specific benefits projected. About $8.7 billion of the nearly $10.3 billion in unsubstantiated cost savings estimates concerned the Command's valuation of the increased number of aircraft expected to be made available through use of the new Requirements Data Bank and the Stock Control and Distribution systems. For example, the economic analysis projected a 5 percent increase in fully capable aircraft (or 175 aircraft) as a result of using the Requirements Data Bank system. The Command used the total procurement cost of the aircraft to value this benefit at over $5.0 billion. According to the Command, these projected benefits were based on studies done by the Logistics Management Institute and other studies internal to the Command. However, the referenced studies were not in the Command's files nor could personnel provide them. The Audit Agency did not question the Command's aircraft estimates, but did not accept the Command's valuation of these benefits. At the conclusion of our

review, the Logistics Command had submitted to the Audit Agency data to support an additional estimated cost savings of $700 million attributable to anticipated reductions in spare parts. An Audit Agency official told us that this additional benefit claim is to be assessed during fiscal year 1989 follow-up audits of the modernization program.

The Command projected the Stock Control and Distribution system would provide a cost savings of $14.4 million attributable to reduced aircraft spare parts requirements and nearly $3.7 billion attributable to increased aircraft availability. However, neither Logistics Management System Center nor Material Management officials could locate documentation supporting the assumptions that they made computing these savings estimates.

In addition to significant cost savings, the Command also had expected the new LMS systems to provide substantial non-monetary improvements to logistics operations. Unlike the cost savings estimates, the Command could adequately support many of these projected mission improvements. For example, the Command estimated that the Requirements Data Bank would result in between 20 and 275 additional aircraft being ready for duty because of improved management of spare parts. The Air Force Audit Agency assessment of this projected benefit found adequate support for 126 to 217 aircraft. The Audit Agency also found support for the Command's estimate that the equivalent of 149 personnel would be saved because of automation of manual processes.

Additionally, the Command expected the prioritization of depot-level repair decisions using the new Stock Control and Distribution system to result in an annual reduction of 1,500 days needed to resolve problems that reduced the mission capabilities of aircraft. The Audit Agency assessment of these benefit estimates substantiated a likely savings equivalent to 157 staff positions and the 1,500 day reduction. Also, the Command expected the new system to provide a 26-hour reduction in resupply order and ship time with a corresponding increase in readiness equal to 107 available aircraft. The Audit Agency found that with some minor adjustments all the projected non-monetary benefits of the Stock Control and Distribution system were supported. Logistics Command officials consider these improvements extremely important, even though they could not accurately assign a monetary value to them.

Fewer Existing Systems to Be Replaced

The original justification for the modernization program identified 94 existing systems that would be eliminated by the nine LMS projects. After the program began, the Command reduced the scope of two LMS projects—the Depot Maintenance Management Information System and the Stock Control and Distribution—by removing 10 existing systems to be replaced from each project.

The Depot Maintenance Management Information System was originally intended to replace 43 existing systems at an acquisition cost of about $83 million. The initial cost proposals by potential contractors for the system ranged from approximately $500 million to over $1 billion. In view of the likely substantial increase over the budgeted project acquisition cost, the Logistics Command decided to remove 10 production cost tracking and work load planning systems from the project. According to the Logistics Management Systems Center Commander, the functionality of these 10 systems will be preserved by keeping the existing systems. While functionality may be preserved, the mission improvements originally expected from the modernization of these 10 systems will be lost.

The Stock Control and Distribution system originally was to replace 23 existing systems at an acquisition cost of about $202 million. During development contract negotiations, the Logistics Command determined that the project was likely to cost over $21 million more than budgeted. To avoid this cost overrun, the Command chose to replace only 13 existing systems. The 10 production management systems removed from the project were to increase the Air Logistics Centers' ability to schedule the distribution of stock, better manage resources, and control recoverable spare parts. Project officials stated that they could not identify the impact that the reduced project scope will have on logistics operations until the new system becomes fully operational.

Benefits of Operational LMS Systems Not Evaluated

The Command has not yet evaluated the cost savings and other benefits provided by any operational LMS system or system increment. The modernization program was designed for incremental development and implementation to provide benefits well before the systems were fully complete. As of December 1988, all nine of the original LMS systems had achieved at least initial operating capabilities with two systems considered fully operational. Personnel were using these systems at the air logistics centers and were receiving benefits. However, as of that time, the Command had not prepared evaluation plans for six of the nine new LMS systems nor had it yet conducted any interim or final system evaluations. As a result, the Command cannot accurately determine the utility or worth of the completed LMS projects or how best to improve ongoing and future system developments.

Department of Defense Instruction 7041.3, Economic Analysis and Program Evaluation for Resource Management, specifies that program evaluations are integral activities to be conducted as early as practical in the acquisition process. The capabilities of operational systems should be evaluated to ensure that expected benefits are attained or to determine how best to improve ongoing projects. The Air Force Logistics Command Supplement 1, Information Systems Program Management, to the Air Force Regulation 700-4, Volume 1, Information Systems Program Management and Acquisition Information Systems Program Management, defines an operational evaluation as an assessment of the benefits achieved as a result of implementing an information system. It directs managers of automated information system development efforts to prepare an evaluation plan no later than 120 days after receiving project approval. Plans are prepared to ensure that appropriate data gathering and benefit tracking procedures are implemented to measure the program effectiveness before and after a new system becomes operational. Further, it directs that a final evaluation for all system developments will normally be accomplished within a year after the system achieves full operational capability, but not until 90 days after transfer of program management responsibilities to the organization that will use the system. It also directs that if a new system is implemented incrementally, operational evaluations should be done incrementally for interim assessment of benefits.

Evaluation Plans Not Prepared

The Command has not prepared system evaluation plans for six of the nine modernization projects. The LMS program was designed for incremental implementation and was initiated in November 1984. Therefore, according to Air Force regulations, an evaluation plan incorporating

incremental system assessments should have been prepared for each LMS project in early 1985. In addition, the Commander of the Logistics Management Systems Center in September 1986 directed that evaluation plans be prepared for all ongoing LMS projects. However, we found that as of December 1988, the Command had prepared evaluation plans for only three of the nine LMS projects. We found evaluation plans for each of the two completed systems—the Engineering Data Computer Assisted Retrieval System and the Weapon System Management Information System, and one for the Enhanced Transportation Automated Data System project.

Officials responsible for the remaining six projects gave various reasons for not preparing evaluation plans. Several officials stated that they planned to measure how well their system resolved operational problems, but had not yet identified an appropriate measurement method. Others stated that, rather than attempting to measure benefits directly, they planned to send questionnaires to system users to obtain opinions on project success. These responses indicate that the Command has not established either the criteria or the methods for evaluating the cost effectiveness of these projects. Without evaluation plans, the Command cannot ensure that appropriate data are collected and evaluation methods are selected for measuring and documenting the systems' operations to provide system managers and users with valid information for making future plans and decisions.

LMS Systems Not Evaluated

The Command has not conducted the required operational evaluations of LMS systems. Although the Air Force considers two projects fully operational and seven partially operational, we found that as of December 1988, the Command had not completed any interim evaluations of partially operational LMS systems nor had it begun the final evaluation of either of the completed systems. Because the Command has not measured benefits being derived by users, it cannot compare benefits received to those it projected when the projects were approved to determine how best to improve ongoing or future projects.

In June 1986, the Commander of the Logistics Management Systems Center stated that three of the nine LMS projects were to be assessed incrementally. For example, interim system evaluations for the Requirements Data Bank project were to be made after implementation of each of nine project modules and a final evaluation was to be made upon completion of the whole system. Operational evaluations of the Intersite Gateway project were to be held between October 1986 and May 1987

upon system acceptance at each of six sites. The Depot Maintenance Management Information System was to undergo two operational evaluations, an interim evaluation after the prototype was complete and a final evaluation after full system operation.

All nine of the original LMS systems have at least initial operational capabilities. As of February 1989, the Air Force had designated two of the nine new systems as having "full operational capabilities" and the remaining seven projects from 2 percent to 95 percent complete. Table IV.1 shows when each new LMS system first attained an initial operating capability and the Command's estimate of the percentage of full operational capability.

Table IV.1: LMS Operating Capability

Project	Date of Initial Capability	Percent Operational February 1989
Requirements Data Bank	Aug. 1985	33
Depot Maintenance Management Information System	Jun. 1986	15
Contracting Data Management System	Apr. 1987	2
Stock Control and Distribution	Jul. 1987	20
Local Area Network	Oct. 1985	95
Enhanced Transportation Automated Data System	Jan. 1987	10
Weapon System Management Information System	Mar. 1984	100
Intersite Gateway	Jan. 1988	95
Engineering Data Computer Assisted Retrieval System	Oct. 1986	100

As of December 1988, the Command had not completed any interim evaluations. According to program management officials, interim evaluations of incremental benefits were not completed because (1) project benefits were not relatable to specific system increments, and (2) interim evaluations were too expensive. Upon approving each of the LMS projects, the Command was required to clearly define the extent to which existing system deficiencies would be improved and provide documentation including the computations used to derive total project benefit estimates. Since the systems were designed to be incrementally implemented, the Command should know the expected benefits to be received from each system increment. Further, the Command cannot estimate the cost of interim evaluations until it has prepared the requisite plans outlining data to be gathered and procedures to be followed for making these evaluations.

For the remaining six LMS projects, the Commander of the Logistics Management Systems Center gave various explanations for not conducting interim evaluations. For example, he said that interim evaluations of the four subsystems of the Enhanced Transportation Automated Data System could not be made because required interfaces with other systems would not be effective until final system operation. Similarly, phase one of the Contracting Data Management System could not be evaluated until completion of phase two. Also, while the Stock Control and Distribution system was to be implemented over a 3-year period, the subsystems needed to measure benefits were among the last to be implemented.

As with interim evaluations, the Command had not started a final evaluation of either of the two completed LMS projects. Although the Command had designated both systems as "having full operational capabilities," one did not have the data to operate and the other was still in development. The Command designated the Engineering Data Computer Assisted Retrieval System and the Weapon System Management Information System as "fully operational" over a year ago. As such, it should have started final operational evaluations of these systems. The Engineering Data Computer Assisted Retrieval System project director stated that the evaluation had been postponed more than a year because of delays in loading the 5 million active engineering data records the system is intended to automate. The director estimated that it could cost over $10 million and take from 1 to 2 years with contractor assistance or 2.5 to 6 years without assistance for the Command to input this data. The benefits of the system will not be realized until at least one site's system has a fully loaded data base. Therefore, we question whether the Command should be reporting this project as having full operational capability.

For the other completed project, the Weapon System Management Information System, the operational evaluation, scheduled to begin in late fiscal year 1988, was delayed until after 1991. The project director stated that a fourth system module was added to the system after the original three modules were completed. Since this module was expected to provide a $393.9 million cost savings, the system evaluation plan was redrafted to include this fourth module. This new module, however, is not expected to be operational until 1991. Therefore, we also question whether the Command should be reporting this project as complete.

LMS System Benefits Are Being Received

Since the Command had not performed any system evaluations, we asked users of the new LMS systems and system increments whether they were receiving any benefits. According to the 160 personnel we interviewed at the five air logistics centers, the new systems are meeting their needs significantly better than do the existing systems being replaced. Table IV.2 summarizes the user views to our questions.

Table IV.2: Summary of User Views on Operational LMS Systems

Question	Yes	No	No Opinion
Does the system meet your needs?	128	30	2
Does the system reduce your work load?	120	34	6
Is the system accurate for your work?	126	28	6
Is the system information up-to-date?	93	63	4

Many users told us that the new systems have reduced their work loads as well as the time needed to perform their tasks. For example, a user estimated that the Item Manager Wholesale Requisition Process segment of the Stock Control and Distribution system reduced work load well over 50 percent. Another user estimated that the Reliability Assessment Module of the Weapon System Management Information System had reduced the time needed to compute the mission capability status of the aerospace vehicle inventory from 3 days to only 6 or 7 hours.

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